Project 3: Hypothesis-Driven Research

Your group should:

1. Develop a hypothesis that can be tested using one of the available sensors.
2. Use the Arduino-board and at least one sensor to collect data.
3. Use Matlab to analyze the data including either a t-test (are two samples statistically different from each other) or linear regression (do two variables correlate with each other). We will talk about how to program these within the class.
4. Create graphics within Matlab to represent your data. These could include plots of the data, bar graphs, or histograms.
5. Create a research poster to present at the undergraduate showcase.

Deliverable 1:

The following tasks should be completed during your next discussion section by 10/26:

1. Interview one of the provided list of researchers. During this interview, you should ask:
    a. What is the primary topic of your research? What is the significance and broader impacts of your research?
    b. How is the research performed? How is data collected and analyzed?
    c. How do you choose a research question and/or hypothesis? What research questions are they asking currently?
    d. What skills does one need to be successful in this type of research?
    e. How can undergraduate students get involved in this type of research?

    Include your findings in the project notebook.
2. Watch this video on the research cycle: https://ugresearch.ku.edu/student/video/cycle How does that relate to what you learned from your interview? Include your findings in the project notebook.
3. Investigate the sensors available (both those in your Sparkfun kit and those listed on Canvas which can be used). Identify what it measures and what the limitations of those measures are (specifications). The Sparkfun website should have this information. Include your findings in the project notebook.
4. Each group member should formulate a research question and hypothesis you might like to test. If your question involves a measure of human performance, plan to only include your group members in the data collection. Share your questions with the group and select one to move forward. Include all of your ideas and the final selection in the project notebook. Suggestions on possible measures are available in Canvas.
5. Take your final idea and write a protocol for how you will test the idea. Include your plans in the project notebook.

Designate a presenter to go through your project notebook updates during your discussion time. Everyone should present twice over the course of the semester for full credit.

Deliverable 2:

The following tasks should be completed during your next discussion section by 11/2:

1. Develop the Arduino code and breadboard circuit necessary to collect the data. This code should send any data you wish to save to the serial monitor. Include your code and breadboard layout in the project notebook.
2. Construct any apparatus that might be needed for your experiment. Tools and other supplies are available in 1100 Learned. Let the GTA know what you need. Safety glasses should be worn when working in the room.

Designate a presenter to go through your project notebook updates during your discussion time. Everyone should present twice over the course of the semester for full credit.

Deliverable 3:

The following tasks should be completed during your next discussion section by 11/9:

3. Collect preliminary data (typically one subject or sample). Are there any issues? How can they be addressed? Include your findings in your project notebook.
4. Work on a Matlab program to analyze and display the data. Your code should import the data from either the serial port directly or from a file of saved data copied from the serial monitor in Arduino. Your code should include at least one graphical representation of your data.

Designate a presenter to go through your project notebook updates during your discussion time. Everyone should present twice over the course of the semester for full credit.

Deliverable 4:

The following tasks should be completed during your next discussion section by 11/16:

1. Collect and analyze at least one full set of data using your Arduino and Matlab programs. Include the results for this work in your project notebook.
2. Make a first draft of a poster for the undergraduate research showcase. A poster template is provided. The poster should include an introduction, a description of the Arduino data collection system you have created, the methods of your data collection protocol, and your preliminary results. Images and figures are encouraged. Upload the draft poster to your Microsoft Teams file folder.

Designate a presenter to go through your project notebook updates during your discussion time. Everyone should present twice over the course of the semester for full credit.

Research Showcase:

The following tasks should be completed during your next discussion section by 11/21:

1. Upload an edited final version of your poster to the undergraduate research showcase by 11/21.
2. Upload a 2-5 minute video presenting your poster to the undergraduate research showcase by 12/1.

Deliverable 5:

The following tasks should be completed during your next discussion section by 11/30:

1. Finish data collection and analysis. Include your findings in your project notebook.

Designate a presenter to go through your project notebook updates during your discussion time. Everyone should present twice over the course of the semester for full credit.

Final Report

By 12/7 you should submit:

1. A group report to gradescope following the project report format. (1 submission for each group, be sure to tag all of your group members)